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Beech Utilization Series No. 14

Use Of Beech In
Rough Construction
On The Farm

by
William J. Nearn

Northeastern Technical Committee
On the Utilization Of Beech

in cooperation with

Northeastern Forest Experiment Station
Forest Service, U.S. Dept. of Agriculture

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ROCKY MOUNTAIN STATION

FOREWORD

The wood of the American beech tree (Fagus grandifolia Ehrh.) is well suited for a large number of uses, and it is rather widely used by manufacturers. Yet the amount used is not in proportion to the amount that grows in our northeastern forests. The utilization of beech--both in the woods and in the factory--has been recognized as a problem.

One reason for this is in the nature of the wood: it has a reputation for being difficult to season. Another is that many of the beech trees in our forests are of poor quality. And there are some plain prejudices against beech.

Research is finding ways to utilize beech as efficiently as any of the other comparable hardwoods can be handled. Considerable information about beech has been gathered. Yet most of this information is available only in fragmentary form in scattered technical reports. Some of it has never been published.

To study the problems of putting beech to the uses it deserves, and to promote the better management of the forests in which it grows, a Northeastern Technical Committee on the Utilization of Beech was organized in 1949. This committee, which includes representatives of Federal and State forestry agencies, universities, and state experiment stations, decided to assemble and publish the available information about the utilization of American beech.

As its part of this cooperative project, the Northeastern Forest Experiment Station has undertaken to edit, publish, and distribute the series of reports that will contain this information.

The subjects of these reports will be as follows:

*Physical and mechanical properties of American beech.

(CONTINUED ON INSIDE OF BACK COVER)

Use Of Beech In Rough Construction On The Farm

by

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BEECH IS A SPECIES that is becoming increasingly common in the farm woodlands of the Northeast. High-quality beech logs usually find a ready market. However, there seems to be a lack of demand at a reasonable selling price for the lower grades. At the same time, species such as hemlock and white pine, which were formerly available to the farmer as construction material, are rapidly disappearing from their woodlands.

Under these circumstances a profitable outlet for the lower grades of beech would be its use in rough construction on the farm. Since this is not one of the more common uses for beech, a number of questions arise about its suitability for this kind of construction.

SUITABILITY OF BEECH FOR FARM USE

Will the use of beech provide a building that has the necessary strength at a lower cost than the usual softwood construction species? Beech is superior in strength proper-

ties to most softwood species; it ranks higher than the oaks.¹ It is fairly certain that if conventional building practices are followed in using beech, the result will be satisfactory.

Beech compares well with other farm woodland species not only on the basis of strength but also in other characteristics that affect its usefulness (table 1). Beech rates "good" for all uses except the building of concrete forms.

Table 1.--Comparison of farm woodland species for use in farm construction

E = Excellent
G = Good
F = Fair

Species	Plates, joists, sills, rafters	Roofers	Studding	Stall flooring*	Gates	Concrete forms	Piers and posts*
Beech	E	G	G**	E	G**	F	G
Birch	E	G	G**	E	G**	F	G
Hemlock	G	G	G	E	G	G	G
Maple	E	G	G**	E	G**	F	G
Oak, red	E	G	G**	E	G**	F	G
Oak, white	E***	G	G	E	E	F	E
Pine, white	F	G	G	E	G**	G	--

Source: Adapted from "Selection of lumber for farm and home building," U. S. Dept. Agr. Farmers' Bul. 1756. 45 pp., illus., 1936

*All species except white oak heartwood require preservative treatment.

**Likely to twist and warp. For studding and gates, it is possible that beech could be given a rating of "E" if the pieces were quarter-sawed and carefully seasoned.

***Best for sills.

It is not possible to discuss in detail all the factors that would determine whether or not a cash savings could be made by using beech. As is the case with any farm-grown timber, farm labor could be used in the off-season for the cutting operation. Hauling logs from the point of felling to the mill could be done with equipment already available to the farm owner. It is even possible that a reasonable exchange of lumber for service could cover the cost of having the material sawed. This, combined with the fact that in many cases there is no ready market for the lower

¹Paul, Benson H., and Drow, John T. Some physical and mechanical properties of American beech. Northeast. Tech. Com. Util. Beech and Northeast. Forest Expt. Sta., Beech Util. Ser. 1. 17 pp., illus. 1951.

grades of beech logs, indicates that the use of home-grown beech would provide farm structures at a low cost in cash and at the same time put the available material to a good use.

It might seem that there is no further question about the desirability of beech for farm construction. Unfortunately, this is not so. Among the objections usually raised to its use are that it is heavy, difficult to season, and hard to nail. It is also considered one of the less durable woods. This is true of practically all the species commonly present on Northeastern woodlots unless they are treated with preservative. These objections should not automatically disqualify beech from further consideration. Recognizing that beech has these disadvantages, and taking steps to minimize their effect, will overcome such objections.

PROPER HANDLING OF BEECH

The proper handling of beech begins with the selection of the standing tree in the woods. There are two things to be considered in making this selection. The first has to do with how the harvesting may be carried out so as to improve the woodland and thus increase its productivity. The second has to do with the selection of the standing trees that will yield the best building material. While the first point mentioned is of prime importance to the future yield of the woodland, it is not a part of this discussion.

In regard to the second, it may be said that a knotty tree trunk or one whose bark shows evidence of grain distortion in the underlying wood is bound to produce material that has strength-reducing defects such as knots and spiral grain. In addition to reducing the strength, these defects will also tend to cause the wood to warp badly when it is seasoned. If these trees are to be removed from the woodland for the purpose of improving the stand, they should be disposed of in the form of products such as tie logs, pulpwood, or fuelwood.

Sawing

Sawing is the next step in the conversion of the tree into lumber. Are there precautions that may be taken to produce lumber that will season well and in general be a good, stable building material? There are one or two sawing rules

that, if followed, will give good results. When possible, the logs should be sawed parallel to the bark rather than parallel to the long axis of the tree. In this way diagonal grain may be avoided. Diagonal grain will affect the wood in the same manner as spiral grain; that is, it will reduce the strength and make it difficult to season without warping.

An attempt should also be made to produce the greatest possible amount of quarter-sawed stock. Beech will shrink and swell in the flat dimension nearly twice as much as it will in the quarter dimension. The quarter-sawed material is more apt to have the same grain alinement and hence the same shrinkage characteristics on both sides of an individual piece. This in turn will mean that the piece will dry without cupping and twisting.

Seasoning

Beech is not an easy wood to season. It shows a great tendency to surface-check and warp. However, it can be seasoned without prohibitive degrade in the thinner sizes. Care and proper handling will eliminate many of these drying defects.

Wood that is to be used in rough construction on the farm will usually be placed in service green or air-dry; so there is no need to consider the kiln-drying of beech for this use. A breakdown of the material into 1-inch boards, two-by-fours, and heavy timbers provides a good beginning point. The best approach to preparing this wood for use would be to season the inch material and the two-by-fours. Careful piling under shelter will produce acceptable results.² Seasoning the heavier timbers would be time-consuming and the advantages would be few. This material could be put to use either green or partially air-dried.

The possibility of putting the wood into service green, and allowing it to season in place, should be considered. One of the principal advantages that may be gained is the increased ease with which the wood can be nailed. In addition, the amount of time needed to convert a standing tree into a usable structure would be reduced.

²Baker, Gregory, and McMillen, John M. Seasoning beech lumber. Northeast. Tech. Com. Util. Beech and Northeast. Forest Expt. Sta., Beech Util. Ser. 11. 22 pp., illus. 1955.

There are a number of disadvantages to such use. The green material is heavy and hard to handle. It cannot be painted until it has had an opportunity to dry. It must be fastened in place more securely than seasoned material. And precautions will have to be taken to see to it that the material is not used in locations where little or no drying takes place; otherwise decay may occur. Shrinkage of the wood may cause openings in the side walls that will necessitate the placing of batten strips when the drying is complete.

These disadvantages do not affect beech alone; they hold for practically all the northern hardwoods. In spite of these disadvantages, it would be well to consider the possibility of using green wood in the smaller farm out-buildings and even for major structures such as barns.

A final point of concern is whether a farm building made of beech will be a lasting structure. Beech should not be used untreated in contact with the ground or in a locality where it is continuously damp. If a structure is temporary, untreated beech could be used in contact with the ground. The useful life of the material under these conditions would be about 5 years.

To comment further on the durability of beech it is necessary to consider its use in two separate ways: in building construction and in fence construction. In the first case, proper design to prevent the wood from coming into contact with the ground would be the best answer to the problem. In this way the builder not only provides protection against decay but also reduces the possibility of damage by wood-boring insects such as termites.

If this solution is not practical, it may be possible for the builder to treat the wood himself.³ Another possibility would be to substitute locust, chestnut, or white oak heartwood in those parts of the building where decay is apt to occur. Either of these ways would be items of additional expense; but in the long run the cost would be far less than the costs of replacements that will be necessary in the near future if these precautions are overlooked.

³Blew, J. Oscar, Jr., and Champion, Francis J. Preservative treatment of fence posts and farm timbers. U.S. Dept. Agr. Farmers' Bul. 2049. 33 pp., illus. 1952.

In the second instance, where beech is being considered for use in fence construction, there are available to the farmer some simple and inexpensive treating methods that he may use to prolong the life of this material in service.

CONCLUSIONS

To summarize it may be said that:

1. Beech is a species that is becoming increasingly prevalent in the farm woodlots of the Northeast.
2. Those species that were in the past available to the farmer as construction material are rapidly disappearing from the average farm woodland.
3. Although high-quality beech logs find a ready market, there seems to be a lack of demand at a suitable price for the lower grades.
4. Although beech is difficult to season when compared to such species as pine or hemlock, proper precautions and care will make it possible to season this material so as to produce satisfactory building lumber.
5. In strength, beech is the equal of those species normally used for the construction of barns, pens, feed bins, etc.
6. Beech is a hard, heavy wood but no more so than other hardwoods that have been used in farm buildings. Like other hardwoods, it is difficult to nail, especially when dry. This handicap may be overcome by putting the wood into service green. If this is not possible, the user will find that although beech will still be more difficult to nail than softwood lumber, the task will become easier with a little experience. Special spirally grooved, flat-pointed nails are available which drive more easily, are less likely to bend, and hold better than ordinary wire nails.
7. Beech is considered a nondurable species. This is true only when it is used in contact with the ground, or under other conditions that favor decay. For use under such conditions, preservative treatments are available.
8. There are no good reasons why a farmer who possesses a woodland containing beech cannot make cash savings through the selection and use of this material for buildings within his farm area.

- * Chemistry and chemical utilization of beech.
- * Silvicultural characteristics of beech.
 - Availability and supply of beech.
 - Present markets and uses for beech.
- * Logging beech and specifications for products.
- * Seasoning beech lumber.
- * Storage of beech logs and bolts.
- * Machining of beech.
 - Milling of beech.
- * Gluing techniques for beech.
- * Steam-bending of beech.
 - Preservative treatment of beech.
- * Beech for flooring.
 - Beech for furniture.
 - Beech for turned products and novelties.
- * Beech for veneer and plywood.
- * Beech for fuel and charcoal.
 - Beech for crossties.
- * Beech for containers.
 - Pulping and defiberization of beech.
- * Rough construction on the farm with beech.

The Northeastern Station acknowledges gratefully the effort being devoted to these problems by the many agencies and individuals who are cooperating in this project. Among the leaders in it are David B. Cook, New York State Conservation Department; Claude Bell, U.S. Forest Products Laboratory; A. H. Bishop, State University of New York, College of Forestry; and Fred Wangaard, Yale University School of Forestry. These men, along with Fred C. Simmons and C. R. Lockard of the Northeastern Station, comprise the working committee that is directing and coordinating the project.

The information gathered in this widespread cooperative project should be of great use to the wood-using industries of the regions where the wood of American beech is available.

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